

1 1. A purified nucleic acid construct comprising:
2 a gene cassette encoding at least one modified bioluminescent protein, said modified
3 protein comprising at least one modification in its amino acid sequence relative to the sequence
4 of an unmodified form of said protein, wherein said modification comprises the addition of a
5 peptide sequence to the protein, said addition reducing a first duration of bioluminescence
6 emitted by said modified bioluminescent protein relative to a second duration of
7 bioluminescence emitted by said unmodified form of said protein.

1 2. The purified nucleic acid construct of claim 1, wherein said gene cassette encodes
2 a luciferase protein.

1 3. The purified nucleic acid construct of claim 1, wherein said gene cassette encodes
2 all proteins necessary for production of bioluminescence without addition of an exogenous
3 substrate.

1 4. The purified nucleic acid construct of claim 3, wherein said nucleic acid construct
2 comprises a lux CDABE cassette.

1 5. The purified nucleic acid construct of claim 2, wherein said luciferase protein
2 comprises at least one a Lux protein selected from Lux A and Lux B.

1 6. The purified nucleic acid construct of claim 5, wherein said Lux protein
2 comprises the amino acid sequence of a Lux protein isolated from bacteria selected from the
3 group consisting of *Photorhabdus luminescens*, *Vibrio fischeri* and *Vibrio harveyi*.

1 7. The purified nucleic acid construct of claim 1, wherein the modified form of said
2 bioluminescent protein comprises a peptide sequence that specifically binds to a protein
3 associated with a proteolytic pathway.

1 8. The purified nucleic acid construct of claim 7, wherein said protein associated
2 with a proteolytic pathway is a tail-specific protease.

1 9. The purified nucleic acid construct of claim 8, wherein the peptide sequence of
2 the modified bioluminescent protein comprises SEQ ID NO:8.

1 10. The purified nucleic acid construct of claim 8, wherein the peptide sequence of
2 the modified bioluminescent protein comprises SEQ ID NO:9.

1 11. The purified nucleic acid construct of claim 8, wherein the peptide sequence of
2 the modified bioluminescent protein comprises SEQ ID NO:10.

1 12. The purified nucleic acid construct of claim 9, wherein the modified protein is at
2 least one of LuxA or LuxB.

1 13. The purified nucleic acid construct of claim 10, wherein the modified protein is at
2 least one of Lux A or Lux B.

1 14. The purified nucleic acid construct of claim 11, wherein the modified protein is at
2 least one of Lux A or Lux B.

1 15. The purified nucleic acid construct of claim 7, wherein said protein associated
2 with a proteolytic pathway mediates degradation of said modified bioluminescent protein via a
3 ubiquitin-proteasome pathway.

1 16. The purified nucleic acid construct of claim 15, wherein said protein associated
2 with a ubiquitin-proteasome pathway is SCF(Grr1).

1 17. The purified nucleic acid construct of claim 15, wherein the peptide sequence of
2 said modified bioluminescent protein comprises a PEST-rich sequence.

1 18. The purified nucleic acid construct of claim 17, wherein said PEST-rich sequence
2 comprises a PEST-rich carboxy terminus of G1 cyclin (*Cln2*).

1 19. A vector comprising a purified nucleic acid construct comprising a gene cassette
2 encoding at least one modified bioluminescent protein, said modified protein comprising at least
3 one modification in its amino acid sequence relative to the sequence of an unmodified form of
4 said protein, said addition reducing a first duration of bioluminescence emitted by said modified

5 bioluminescent protein relative to a second duration of bioluminescence emitted by said
6 unmodified form of said protein.

1 20. The vector of claim 19, wherein said vector is a plasmid.

1 21. The vector of claim 19, wherein said vector is an expression vector suitable for
2 driving expression in a cell type selected from a bacterial cell, a yeast cell and a mammalian cell.

1 22. A prokaryotic cell comprising the vector of claim 19.

1 23. The prokaryotic cell of claim 22, wherein said cell is a bacterial cell.

1 24. The prokaryotic cell of claim 22, wherein said vector in said bacterial cell
2 comprises the purified nucleic acid of claim 7 or 8.

1 25. A eukaryotic cell comprising the vector of claim 19.

1 26. The eukaryotic cell of claim 25, wherein said cell is a yeast cell or a mammalian
2 cell.

1 27. The eukaryotic cell of claim 25, wherein said vector in said cell comprises the
2 purified nucleic acid of claim 15.

1 28. The purified nucleic acid of claim 1, wherein the duration of bioluminescence is
2 determined by comparing a time course of a first measure of bioluminescence emitted by said
3 modified protein and a time course of a second measure of bioluminescence emitted by said
4 unmodified protein.

1 29. The purified nucleic acid of claim 28, wherein said first measure is between about
2 100-fold and 1000-fold lower than said second measure.